CLASSIFICATION OF MULTIBEAM SNIPPETS DATA USING STATISTICAL ANALYSIS METHOD

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requirements for the award of the degree of
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I humbly dedicate this thesis to

My Grandmother

Wong Ksuin

My Beloved Parent

Lau Mun Hong & Hui Mew Ying

My Family Members

Lau Sook Fun

Lau Sook Yen

Lau Kum Fai

My Loved One

Lim Li Xin

Buddies & Friends

Thanks for your support and encouragement.

Thanks for the blessing and best wishes.

Thanks for the sacrifice and patience.

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ABSTRACT

The multibeam snippets data, an acoustic backscatter data acquired by the multibeam sonar systems, carries important information about the seafloor and its physical properties, thus aid in seafloor classification. This acoustic backscatter strength is highly dependent of incidence angle due to different mechanism of scattering with different angular domains. Therefore, it is necessary to perform certain corrections for the backscatter data before producing the hydrographic plan. This is solved with the radiometric correction using CARIS HIPS & SIPS 7.0 software and geometric correction using Matlab programming. Radiometric correction removed the Time Varied Gain from the data while geometric correction corrected the data for local bottom slope, seafloor insonified area and angular dependency. The seafloor can be classified using the produced distribution histogram of the desired study area. It is found that the snippets intensities estimated from the mean of snippets intensities provide an accurate measurement of the actual intensities strength of the seafloor and play an important role in correcting the angular dependency of the data. Besides that, the Gamma distribution model is found to be fitting well with the distribution of snippets intensities. The parameters of the Gamma distribution model, the scale and shape parameters are found to be dependent on the incidence angles of data. Furthermore, the Kolmogorov-Smirnoff test was carried out to access the fitting of other statistical distribution models such as the Rayleigh and Log-normal distribution models in fitting with the distribution of snippets intensities. It is shown that the Rayleigh and the Log-normal distribution models followed only with the head of the distribution of the experimental data but not towards the tail of experimental distribution. Further experiment on comparing the backscattering characteristics of snippets data that were collected from different types of seafloor habitats is recommended for future research.

ABSTRAK

Data pemerum gema berbilang alur *snippets*, suatu data sebaran akustik yang diperolehi dengan sistem pemerum gema berbilang alur, membawa maklumat penting mengenai dasar laut dan sifat-sifat fizikalnya serta membantu dalam pengklasifikasian dasar laut. Kekuatan sebaran balik akustik ini amat bergantung kepada sudut tuju sebaran disebabkan oleh mekanisme sebaran yang berbeza dengan domain yang berlainan sudut. Oleh itu, pembetulan tertentu perlu dilakukan bagi data sebaran balik sebelum menghasilkan pelan hidrografi. Ini dapat diselesaikan dengan pembetulan radiometrik menggunakan perisian *CARIS HIPS & SIPS 7.0* dan pembetulan geometrik menggunakan pengaturcaraan *Matlab*. Pembetulan radiometrik membetulkan data untuk *Time Varied Gain* manakala pembetulan geometrik membetulkan data untuk kecerunan dasar laut, keluasan kawasan dan pergantungan kepada sudut. Dasar laut boleh diklasifikasikan dengan menggunakan histogram taburan untuk kawasan kajian tersebut. Adalah didapati bahawa keamatan *snippets* yang dianggarkan daripada min keamatan *snippets* menyediakan suatu ukuran tepat kekuatan keamatan sebenar dasar laut dan memainkan peranan penting dalam membetulkan pergantungan sudut data. Selain itu, model taburan *Gamma* didapati sesuai dengan taburan keamatan *snippets*. Parameter model taburan *Gamma*, iaitu parameter skala dan bentuk didapati bergantung kepada sudut tuju data. Tambahan pula, ujian *Kolmogorov-Smirnoff* telah dijalankan untuk mengakses penyesuaian model taburan statistik seperti *Rayleigh* dan *Log-normal* dengan taburan keamatan *snippets*. Keputusan menunjukkan bahawa taburan model *Rayleigh* dan *Log-normal* hanya mengikuti taburan data eksperimen di permulaan tetapi tidak ke akhir taburan eksperimen. Eksperimen selanjutnya bagi perbandingan ciri-ciri sebaran data *snippets* dari pelbagai dasar laut dicadangkan untuk kajian pada masa hadapan.